ursula, should not be considered a sufficiently good species.—— The entomological papers from the transactions of the Iowa State Horticultural Society, for the year 1882, have been published separately for gratuitous circulation, and contain much information of practical value from Hon. J. N. Dixon, Miss Alice B. Walton, and Professor Herbert Osborn.——The monthly meetings of the Brooklyn Entomological Society will hereafter be held on the last Saturday of each month in Wright's business college, corner of Broadway and Fourth Streets.——The Stettiner Entomologische Zeitung, Vol. 44, 1883, Nos. 7–9, contains beside others of less general interest the following papers: Dr. H. A. Hagen's contributions to a monograph of the Psocidæ (continued); Remarks upon the influence of change of food upon morphological varieties, especially in the species of the genus Eupithecia, by Dr. A. Speyer; H. B. Möschler's notice of Fernald's catalogue of N. A. Tortricidae; and Dr. C. A. Dohrn's list of Zeller's entomological papers, published after the appearance of Hagen's Bibliotheca.——At the fiftieth anniversary meeting of the London Entomological Society, held May 2d of this year, Professor J. O. Westwood was elected by acclamation titular life-president of the society.

ZOÖLOGY.

THE SEA PENS OR PENNATULIDA.[1]—Professor Milnes Marshall and Mr. W. P. Marshall give an important and interesting account of the Pennatulida collected in the Oban Dredging Excursion of the Birmingham Natural History and Microscopical Society. *Funiculina quadrangularis*, *Pennatula phosphorea* and *Virgularia mirabilis* were the three forms collected.

The very primitive nature of the first of these is indicated by the irregular arrangement of the polyps, their independent insertion into the rachis, and in the comparatively slight difference between the polyps and the zoöids, as well as by the shortness of the stalk, or part of the colony devoid of polyps. In Pennatula we have the polyps fused into leaves, and there is a considerable difference in the size of their constituent parts, as well as great anatomical differences between the polyps and the zoöids; the stalk is also relatively much longer.

Virgularia is shown to be the most modified by the restriction of the reproductive organs to imperfectly developed polyps, and, in addition to these points, by the presence of the so-called radial vessels which are absent from the other two forms.

A very curious discovery has been made with regard to Virgularia; with but one exception all the known specimens of Virgularia are mutilated, the lower end being generally, and the upper always wanting; as a hypothesis, the author some time ago suggested that the tips were probably bitten off by some marine ani-

[1] 8vo, Birmingham, 1883, pp. 81 (4 pls.).

mals, probably fish. Since then they have (through Mr. R. D. Derbyshire) been able to examine the contents of a stomach of a haddock, which consisted of five fragments of *V. mirabilis*, and of these, three were "actual perfect upper ends;" as a possible explanation of this mutilation it is suggested that the apparent absence of stinging-cells from this species is not only apparent but real, so that the fish are enabled to bite at them with impunity. As the specimens examined were not in a thoroughly satisfactory condition for histological study, the question must be examined again with more satisfactory specimens.

The evidence afforded by the dredging leads to the supposition already suggested by Richiardi and Kölliker, that *Funiculina forbesi*, the supposed British species, is only the immature form of *F. quadrangularis*, which is well known from the Mediterranean. The most complete example from Oban is only thirty-nine inches long, but at Hamburg there is a stem eighty-nine inches in length.

The foregoing notice has been taken from the Journal of the Royal Microscopical Society. Having received from the authors a copy of the book, we can bear testimony to the excellence of the plates. The authors quote Dalyell's statement that Virgularia when in captivity "remains contracted during the greater part of the day, and the organs are seldom displayed before five or six in the afternoon;" but the authors with more reason suggest that Pennatula appears to be "nocturnal" when brought to the surface, "simply because the amount of light it receives in broad daylight is vastly in excess of what it receives normally at the sea bottom, and that it is only towards evening that it is placed under what to it are normal conditions as to amount of light."

The authors are strongly in favor of the now generally accepted view that Pennatula lives upright, planted in the sea bottom.

As regards the phosphorescence observed in the majority of the Pennatulida, *P. phosphorea* receiving its name from having this property, the authors say: "This was well seen in the Oban specimens while living; the more perfect female specimens when suspended in a jar of sea water in the dark, and irritated or excited by gently brushing the leaves, exhibited a fine display of phosphorescence, the different polypes, when touched, showing minute brilliant points of light which appeared to flash over the whole surface of the feather in rapid irregular corruscations." Panceri's observations on this subject are adopted, and his views presented at some length.

HETEROGENETIC DEVELOPMENT IN DIAPTOMUS, ETC., CORRECTIONS.—The editors kindly allow me space to make the following emendations to the article entitled Heterogenetic Development in Diaptomus, rendered necessary by an unfortunate loss of proof in the mail.

Cyclops pectinatus (p. 499) should have stood "*C. thomasi*

Forbes?" It is at least the southern representative of this species, which consequently is distributed from the Great lakes in Minnesota to the gulf. The similarity to *C. bicuspidatus* Cls., is very close.

The description of Epischura (pp. 384–85) was written before the second part of Mr. Forbes' paper was obtained, and in making up for the press, the generic description given in that place was not referred to. It might be inferred from remarks on p. 384, that in *E. lacustris* the female has a structural modification of the abdomen, which is obviously not stated by Forbes.

Although the writer has since succeeded in rearing one Copepod (Canthocamptus), and observing the transition from one of the dimorphic conditions to another, and the two stages, in both of which eggs are carried, are strikingly diverse, it should be admitted that perhaps too much confidence was expressed in the inferred conclusions upon Diaptomus.

It may be that Brady has confused two distinct species in his account of *D. castor*, inasmuch as his descriptions disagree with those of Sars. It is evident that the same peculiarities of distribution maintain in England as here, however explained. Corrections and information bearing upon these questions are earnestly solicited.

An opportunity for comparing types of *Diaptomus pallidus* with *D. sicilis* shows that the differences are even less than indicated, consisting of the greater robustness of the latter and a greater elongation of the antennæ in the former. There is a difference of .1^{mm} in the length of the living adults seen.—*C. L. Herrick.*

The Coxal Glands of Arachnida and Crustacea.—In this journal for September, 1875, we described certain gland-like organs of Limulus, supposed to be renal in their nature, situated at the base of the legs. We then said that the organ "in its general position and relations was probably homologous with the green gland of the Decapod Crustacea, and its homologue in the lower orders of Crustacea, which is supposed also to be renal in its nature. It may also possibly represent the organ of Bojanus in the Mollusca, which is said to be renal in its function. It perhaps represents the glandular portion of the segmented organs in worms."

In the Proceedings of the Royal Society, No. 221, 1882, Professor Lankester, in a paper "On the coxal glands of Scorpio, hitherto undescribed and corresponding to the brick-red glands of Limulus," revoking his first expressed opinion (*Quart. Journ. Mic. Sci.*, 1881) that these were not "of a glandular nature at all," concludes from histological examination that they are glands, and calls them "coxal glands." He was also unable, as were ourselves, to find any openings into the great veins, or "to detect the situation of their opening to the exterior." Lankester then de-

scribes the coxal glands of Scorpio, and also finds that the coxal glands of Mygale are elongated and lobed as in Limulus. He remarks: "Possibly such coxal glands are in all cases the modified and isolated representatives of the complete series of tubular glands (Nephrida) found at the base of each leg in the archaic Arthropod Peripatus." As will be seen in the foregoing note on Peripatus, that animal is provided with a series of paired organs which Moseley and Balfour, with Sedgwick, regarded as Nephridia, homologous with those of Chætopod worms.

It now appears that homologous organs exist in a third type of Arachnida, for not only do the spiders and Pedipalpi possess coxal glands, but also the mites. In his excellent "Observations on the Anatomy of the Oribatidæ," in the February number of the Journal of the Royal Microscopical Society, Mr. A. D. Michael describes a sac which he believes to be glandular, and which he calls the "super-coxal gland." The organ was first recognized in the mites of this family by Nicholet, who supposed it to be connected with what he and others imagined to be the stigma.

When the upper part of the cephalothorax, and the adipose tissue which underlies it, has been removed, "what appears to be the enlarged, blind end of a fine colorless sac, may be seen on each side of the body, the seemingly blind end being nearest to the eye; the sac descending obliquely downward and slightly forward, and being attached close to the acetabulum of the coxa of the second leg; a closer examination shows that this is not the only attachment, but that the lower end is apparently bifurcated, and that the second branch is attached much nearer to the center of the body, and higher in level than the coxal branch. On dissecting out this sac, and carefully extending it, a matter by no means easy, it will be found that what seemed to be the blind end was not the end at all, but that the whole organ is an elongated sausage-shaped sac, bent upon itself in the middle and taking a single turn, so that the two halves cross, but for some distance the two limbs of the horseshoe (if I may call them so) lie over each other, or are so closely pressed against one another as to appear one; it is only toward the end, that they stand free from each other when *in situ*."

Mr. Michael suggests that these glands are analogous to the nephridia (segmental organs) of Vermes, and the green gland of Astacus and other Crustacea, and the coxal glands in scorpions and Limulus. The resemblance to the segmental organs of worms, especially the leech, is very considerable as regards the general form of the organ, and to a lesser extent in the minuter structure, and if the double lines described in Michael's account be tubules, "they would be analogous to those in the nephridia. The sac (super-coxal gland) would correspond with the gland in the nephridium, and the globular body with the vesicle."

It thus appears that there is a probable homology between the coxal glands of Arachnida (including mites, pedipalps and spiders) and the Merostomata (Limulus), *i. e.*, the archaic Crustacea; it remains to be proved whether the green glands of the Decapoda, and corresponding organs in other Neocaridous Crustacea are the homologues of the coxal glands described. Meanwhile true segmental organs, seventeen pairs, corresponding to the segments of the body and situated opposite to the bases of the feet, and with external openings situated on the ventral surface of a certain number of the legs, occur in Peripatus. The occurrence of these organs in Arachnida, as well as in Crustacea, indicate the independent origin of these two types of Arthropoda from the forms resembling some of the lower worms. We are next to look for their occurrence in the Myriopods. Possibly the repugnatorial pores of Chilognath may be found to be these glands, which open above the insertions of the legs.—*A. S. Packard, Jr.*

Submetamorphoses of Fishes. — Professor A. Agassiz has published the third part of his researches upon the submetamorphoses of the young of bony fishes, including the genera Labrax, Stromateus, Atherinichthys, Batrachus, Lophius, Cottus, Ctenolabrus, Gadus, Osmerus and some others.

The caudal fin passes through a heterocercal stage before attaining the more or less homoocercal form that characterizes the teleost caudal, and the pectorals pass through phases which recall those of the Crossopterygia.

When two dorsals are formed from the continuous membranous fold which is the source of all the vertical fins, the posterior appears to be usually differentiated before the anterior, but first passes through a phase in which the two are confluent, though the anal and caudal are already distinct. In Lophius the abnormal form of the first dorsal is evident in embryonic stages, and this is also the case in other forms with filamentary rays in front of the dorsal. The anal is developed before the ventrals except when the latter are adapted to some special purpose, as in the young of some ganoids,, in some deep-sea fishes and in forms in which the ventral rays form long tactile filaments. The young of *Lophius piscatorius*, when about an inch and a quarter long, looks almost like a butterfly from the great development of its paired fins, and the same occurs in the genus Onus. These extraordinary ventrals represent the enormous appendages of Pterichthys and other Devonian genera.

In the position of the mouth, the cartilaginous skeleton, the heterocercal tail, the great pectorals, and the rudimentary dorsal and anal fins, the young of existing osseous fishes recall the primitive fishes, the transformations of which into modern types can be traced through the geological ages from the Devonian upwards.

Many fishes leave their eggs floating upon the surface of the sea as, for example, the cod, some flat fishes, Ctenolabrus, Cottus, etc. Eggs thus obtained are in excellent state for embryological purposes, and from the advanced state of their segmentation it is probable that they are deposited at night, which, as Mr. Ryder first observed, is the time chosen by many marine fishes. The eggs of Lophius float on the surface in the form of great ribbons, agglutinated by a mucous material.

THE OSTEOLOGICAL CHARACTERS OF THE GENUS HISTRIOPHOCA. —About two years ago two specimens of the ribbon seal (*H. fasciata*), a male and a female, were obtained by Mr. Wm. H. Dall at Plover bay, East Siberia, and deposited in the National Museum. In the skeleton of the female the preparation of which is now completed, we have, so far as I am aware, the first accessible material for an accurate diagnosis of the genus.

Diagnosis of the genus Histriophoca.—General appearance of the skull short, broad and rather high. Dental formula as in Phoca and Halichœrus. Molars small, conical, with rudimentary accessory cusps; single rooted, except the last three upper and last lower ones. Facial portion of the skull very short and of medium breadth. Nasal bones small and very short. Palatal area broad, elliptical, moderately emarginate behind. Narial septum nearly complete. Interorbital bridge narrow; orbital fossæ short but broad. Supraorbital processes rudimentary. Brain case large, occupying one-half the length of the skull. Auditory bullæ very large. Lower jaw of medium length, small; rami as in Phoca. Scapula without acromion. Iliac crests abruptly everted. First digit of the manus longest.

From the foregoing diagnosis it is apparent that the genus bears close relations to the other genera of the sub-family. It is difficult to decide to which it most closely approximates, but I should be inclined to place it between Phoca and Erignathus. It is my intention to publish elsewhere,[1] in a short time, a thorough description of the skeleton, upon a consideration of the characters of which this view is based.—*Frederick W. True, March 12, 1883.*

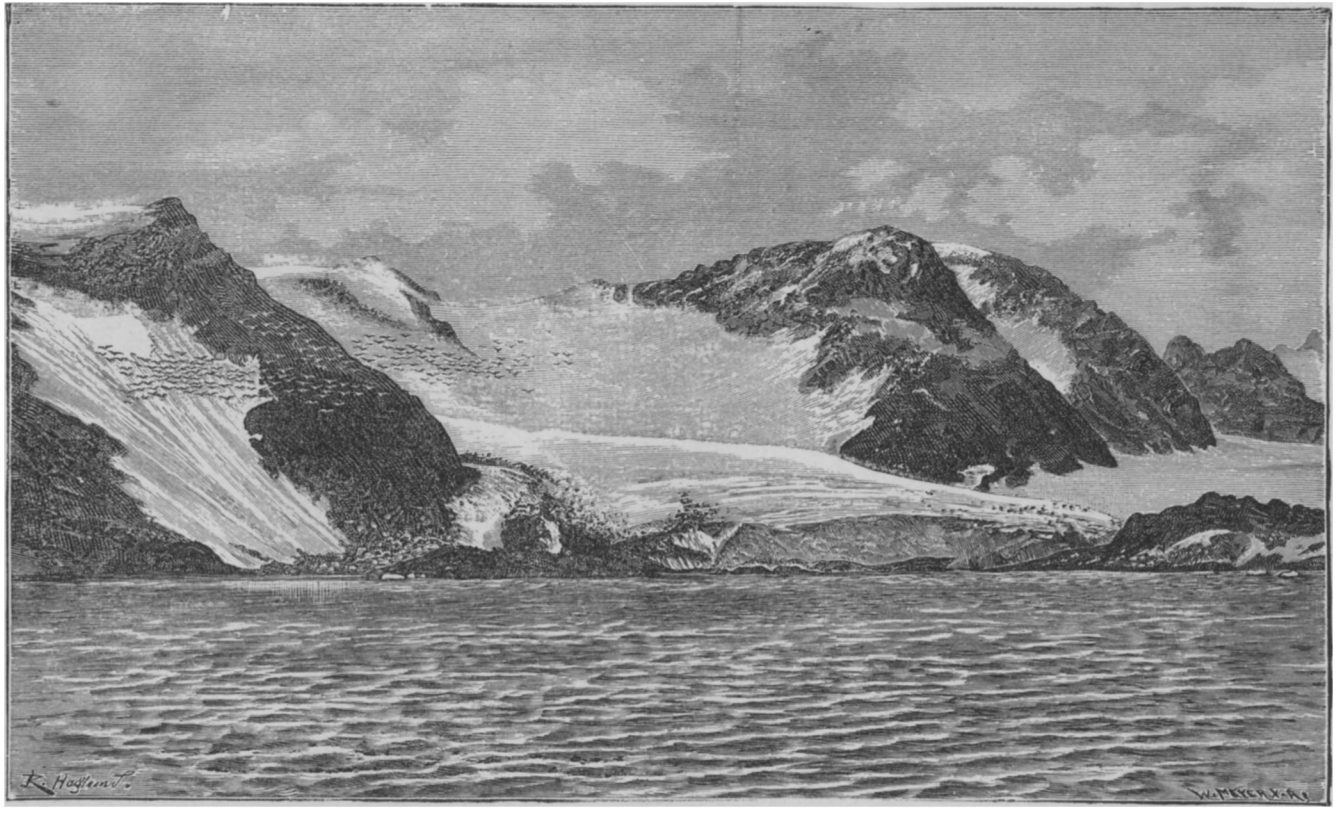
THE BREEDING PLACE OF THE LITTLE AUK.—The accompanying view of Foul bay, on the west coast of Greenland, with glaciers descending into the sea, is taken from Nordenskiöld's voyage of the *Vega;* while it is a characteristic Spitzbergen view, and probably fairly well represents the aspect of the coast of Maine during the height of the glacial period, it was designed by the author to illustrate the breeding place of the little auk (*Mergulus alle* Linn.). This is one of the most abundant of the sea birds of Northern America and Europe, straying south in the winter along our coast as far as the Middle States, and being sometimes driven inland by storms.

On Spitzbergen it occurs in incredible numbers, and breeds in the talus, 100 to 200 meters high, which frost and weathering form on the steep slopes of the coast mountain sides. These stone heaps form the palace of the rotge (or sea king, as the little

[1] In the Proceedings of the U. S. National Museum.

auk is variously called), richer in rooms and halls than any other in the wide round world. "If one climbs up among the stones, he sees at intervals actual clouds of fowl suddenly emerge from the ground either to swarm round in the air or else to fly out to sea, and at the same time those that remain make their presence underground known by an increasing cackling and din, resembling, according to Friedrich Martens, the noise of a crowd of quarreling women. Should this sound be stilled for a few moments, one need only attempt, in some opening among the stones, to imitate their cry (according to Martens: *rott-tet-tet-tet-tet*) to get immediately eager and sustained replies from all sides. The fowl circling in the air soon settle again on the stones of the mountain slopes, where, squabbling and fighting, they pack themselves so close together that from fifteen to thirty of them may be killed by a single shot. A portion of the flock now flies up again, others seek their safety, like rats, in concealment among the blocks of stone. But they soon creep out again in order, as if by agreement, to fly out to sea and search for their food, which consists of Crustacea and Vermes. The rotge dives with ease. Its single bluish-white egg is laid on the bare ground without a nest, so deep down among the stones that it is only with difficulty that it can be got at. In the talus of the mountains north of Horn sound, I found on the 18th June, 1858, two eggs of this bird lying directly on the layer of ice between the stones. Probably the hatching season had not then begun." "Where," adds Nordenskiöld, "the main body of these flocks of birds passes the winter is unknown, but they return to the north early—sometimes too early." We should think it quite obvious that the birds scattered over the North Atlantic south of the region of winter ice, where they can find their food in the sea; but Nordenskiöld adds in a footnote the suggestion that they may "pass the winter in their stone mounds, flying out to sea only at pretty long intervals in order to collect their food."

Zoological Notes.—*Vermes.*—Mr. J. S. Kingsley (Proceedings Boston Society Natural History 1882, 441) gives some points in the development of *Molgula manhattensis*, and figures various stages. The segmentation closely resembles that of many mollusks. The blastopore becomes entirely closed. In their mode of origin and position the cells destined to form the tail seem homologous with those which form the tail-fold of vertebrates. The tail continues to grow until it reaches entirely round the anterior portion of the embryo, and about the same time the eye-spot forms. The chorda dorsalis commences to break down previous to hatching. The general appearance and mode of swimming of the young resembles that of the batrachian tadpole. Certain processes develop upon the surface of the body, but are finally absorbed without serving, as has been believed, as aids in the attachment of the larva.



Foul bay, on the west coast of Greenland, with glaciers. From Nordenskiöld.

PLATE XX.

Mollusks.—The deep-sea mollusks are still engaging the attention of malacologists. From Mr. Gwyn Jeffreys we have received a recent paper on the mollusks of the "Lightning" and "Porcupine" expeditions, in which he gives the results of comparison of these shells with subappennine and Sicilian tertiary shells; teaching first, the exact concordance of so many species in their fossil and recent state, notwithstanding the lapse of the enormous and incalculable time which has intervened, and second, the extensive changes which have taken place during the same period between the depth of the ocean and the height of land in the North Atlantic area. In the Linnæan Society's journal appears parts XV and XVI of Rev. R. B. Watson's Mollusca of the *Challenger* expedition.

Crustaceans.—M. Hartog has been studying the unpaired median eye which he regards as the primitive eye of the Crustacea, since it exists in the naupliiform larvæ of all the orders, and even in the phyllosomatous larvæ of the loricate decapods. It is the only eye the Copepoda possess, but the single eye of the Cladocera is formed by the union of the two compound eyes. This eye, as shown by Claus, consists of a central pigmented mass in which are immersed two lateral and a central lenticular crystalline spheres. The eye is situated on the terminal process of the brain, and the optic nerves proceeding from it skirt the outer surface of the crystalline sphere and penetrate it near the hinder margin. This eye, therefore, may be considered as composed of three simple eyes, placed anterior to the brain, with reversed optical bacilli, and brought so close together that their pigmented or choroid layers are combined into a single mass. The eyes of the Chætognaths, though paired, have a similar structure, and certain Planarians have eyes like one of the simple eyes that are united in the median eye of the Crustacea.

Vertebrates.—The fecundation of the ova of the lamprey is accomplished by actual copulation, but the ova are many and small, and are deposited in the same manner as in the majority of fishes. In sharks, rays, viviparous perch, and other fishes in which sexual union takes place, the eggs are few and large, and fecundated egg develops within the body of the mother. The European lamprey, according to M. L. Ferry, has by the end of June or beginning of July deposited its ova and regained the sea, which it left early in the spring.——G. Smirski has published a paper on the development of the shoulder girdle and the skeleton of the pectoral fin of the pike. Gegenbaur's Morphologisches Yahrbuch, in which the essay is noticed, also contains a paper on the development of the vertebræ of teleosts, by B. Grassi; also G. Baur's article on the tarsus of birds and Dinosaurs; it also notices Aeby's paper on the bronchial tube of mammals and man.——Dr. Yarrow's check list of North American Reptilia and Batrachia, issued by

the United States National Museum, forms a volume of 250 pages; the nomenclature and classification being based on the list of Professor Cope, forming the first bulletin of the series, of which the present is the twenty-fourth.——Recent experiments by Drs. Mitchell and Reichert, indicate that *Heloderma suspectum* is poisonous. It is usually sluggish in its habits, and will not bite unless provoked; but when the full-sized lizard (it grows to a length of three feet) does bite, it produces a poisonous wound, which may prove fatal. For the purpose of experiment, Dr. M. caused the lizard to bite on the edge of a saucer, and when saliva commenced to flow it was caught on a watch glass. Differing from the saliva of venomous reptiles, which is always acid, the saliva of the Heloderma is alkaline. A very small quantity injected into a pigeon produced its effect in a tottering gait in less than three minutes, and caused death in less than nine minutes. The specimen presented was fourteen inches long, fat and plump. See NATURALIST, 1882, p. 907.——That pigs will dive for fish is averred by J. C. Hughes, in *Forest and Stream*, who, writing from British Columbia, says: "Pigs living upon the clear-water rivers learn to dive after the salmon lying dead on the bottom of the streams, and the interesting sight may be witnessed of a sow diving for a salmon, and when obtained taking it ashore for her little ones."

General.—The third heft of the current volume of Gegenbaur's Morphologisches Yahrbuch contains a paper by Bütschli on a hypothesis relative to the derivation of the vascular apparatus of a part of the Metazoa.——Under the title, "Life, and its physical basis," Professor H. A. Nicholson discusses protoplasm, and so-called "vital" phenomena; while he discards the old "vital force" of the vitalists, he holds the hypothesis of an inner directing power in the vital phenomena of the higher to be absolutely inevitable, and that if this applies to man so it must to the moner.

PSYCHOLOGY.

GLUTTONY IN A FROG.—A rather interesting incident occurred while I was a student in the Sheffield Scientific School, of Yale College. In the Peabody Museum we had a large wire cage containing numerous reptiles and among these was a frog of unusual size.

On one of our excursions I brought in a number of frogs and other animals, and going to the cage dropped the contents of the jar, frogs and all, down among the animals at the bottom. The large frog, which had been confined there for some time, caught one of the small ones before it reached the bottom of the cage, and swallowed it with as great ease as he would have captured a fly. This quickly done, he sat and looked about with an air of satisfaction for a moment, then sprang upon another of medium size, caught and swallowed it as quickly as the first. This done,